

Wind Siting Council Setback & Siting Analysis

PSC REF#:132584

Public Service Commission of Wisconsin
RECEIVED: 06/03/10, 1:09:17 PM

Case Study: Glacier Hills Wind Park

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June 2, 2010

we energies



Presentation Agenda

- Identify key wind farm siting criteria
- Basis to benchmark against Glacier Hills Wind Park
- Scenarios and impacts of various setback standards
- Interaction of sound and setback standards
- Characteristics of shadow and setback distances
- Recommendation on use of setback distances vs. performance standards



Key Wind Farm Siting Criteria

- Good wind energy resource
 - Energy available is based on the cube of the wind speed
- Close proximity to high voltage transmission
 - Wind farms produce too much energy for low voltage transmission and distribution lines
 - New high voltage transmission is expensive to build - \$1,000,000+ per mile
 - Long transmission lines are complicated to permit across multiple jurisdictions



Key Wind Farm Siting Criteria

- Low population density
 - Generally larger farms and fewer landowner participants required
 - Greater flexibility to accommodate landowner and community requested modifications
 - More alternative turbine locations and flexibility to accommodate permitting agency requirements
 - Higher percent of residents are connected to an agricultural economy that values the financial benefits of harvesting the wind resource



Benchmark to Glacier Hills Wind Park

Selection Criteria

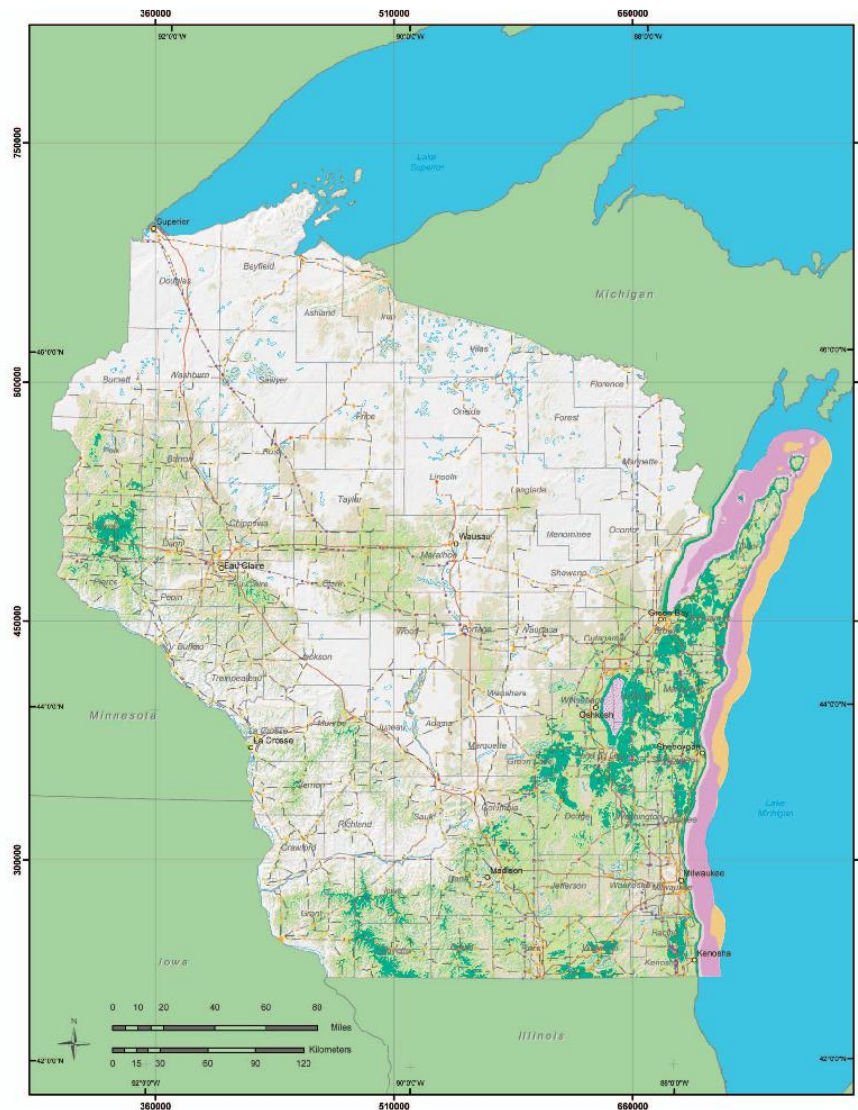
- Towns at least partially within the highest wind regime category for Wisconsin
- 100+ Kv Transmission available within 10 miles
- Housing unit density at or below 7 per sq. mile*

Potential Shortcomings

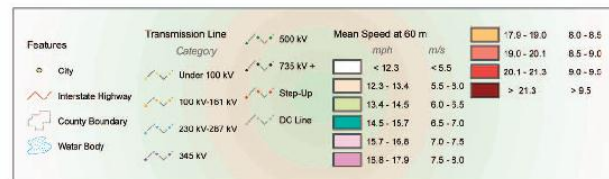
- Table top exercise that does not account for constructability challenges, environmental limitations, or transmission capacity limitations

* Other Wisconsin Projects: Forward 12, Blue Sky 19, Proposed Ledge 15





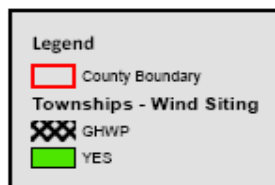
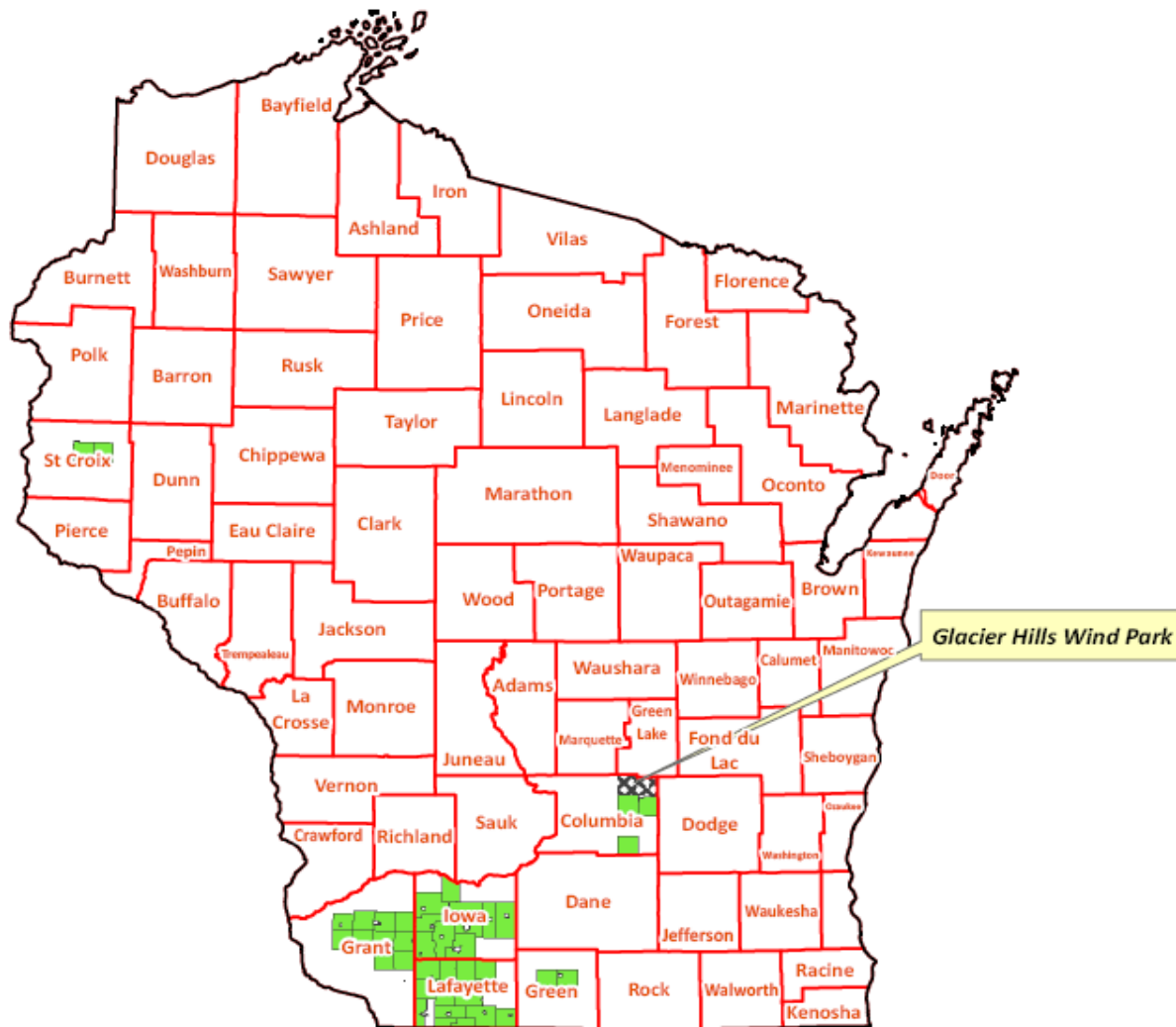
Wind Resource of Wisconsin *Mean Annual Wind Speed at 60 Meters*



Projection: NAD 1983 HARN Transverse Mercator
Spatial Resolution of Wind Resource Data: 200m
This map was created by AWS Truewind using the Mesoscale system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resources, estimates at any location should be confirmed by measurement.

The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.
Source date: December 2000



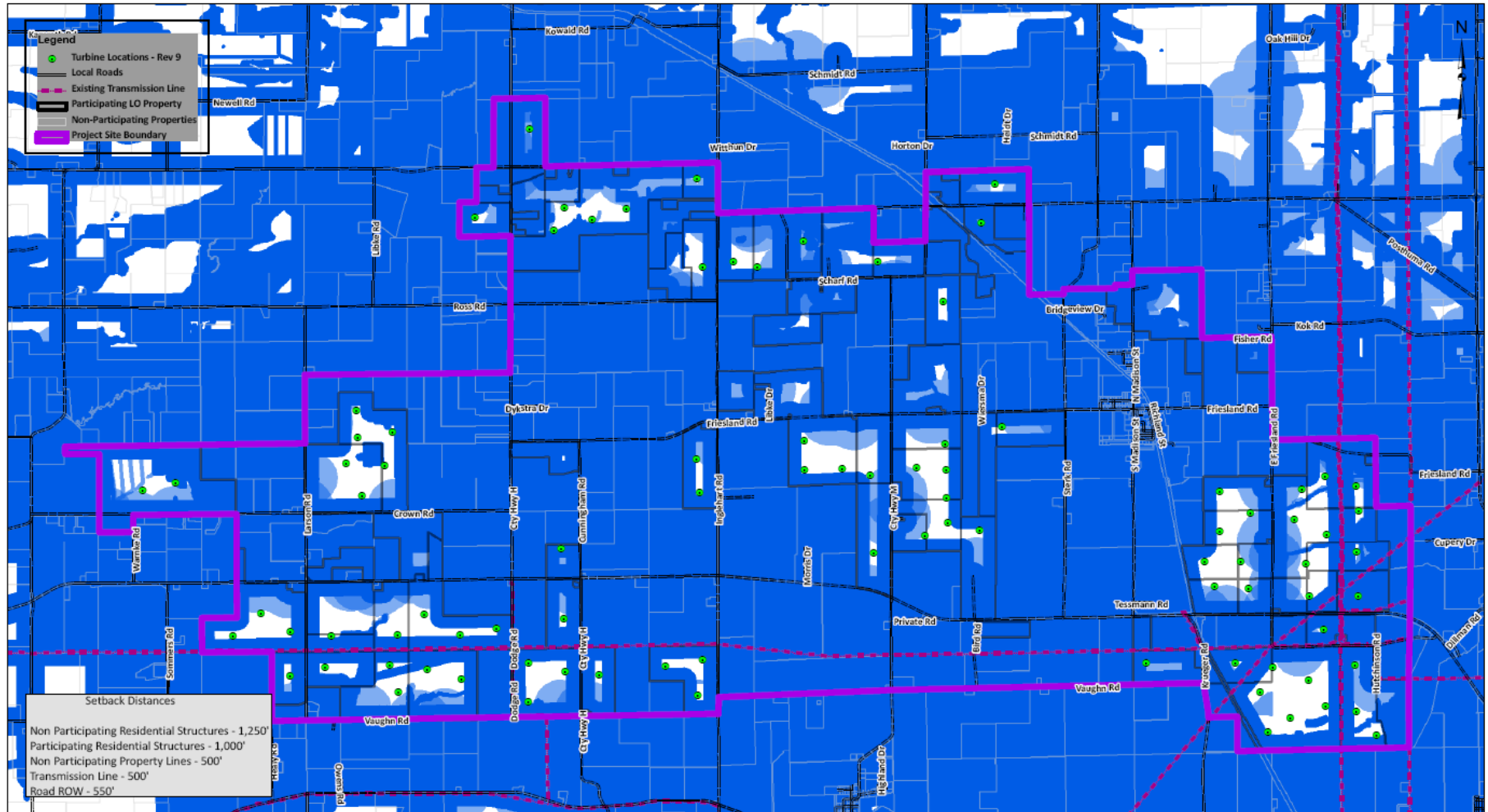


Impacts of Setback Distances On Glacier Hills Wind Park Layout

- Map 1: PSCW Approved Setbacks
- Map 2: Non-Participating Resident Setback Increased
- Map 3: Non-Participating Property Line Setback Increased
- Map 4: Combined Setback Increases



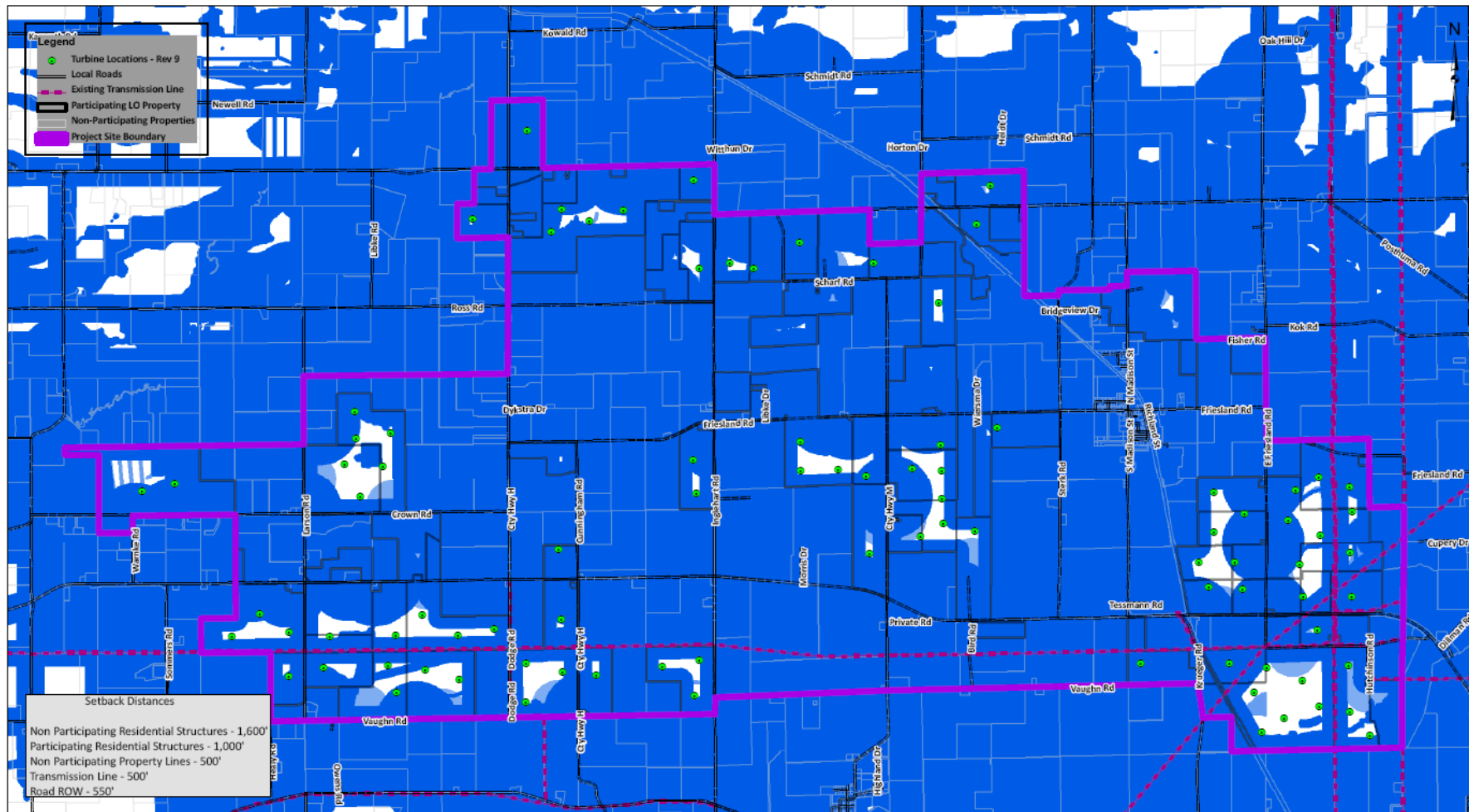
Map 1: Glacier Hills Wind Park CPCN Approved Setback Standards



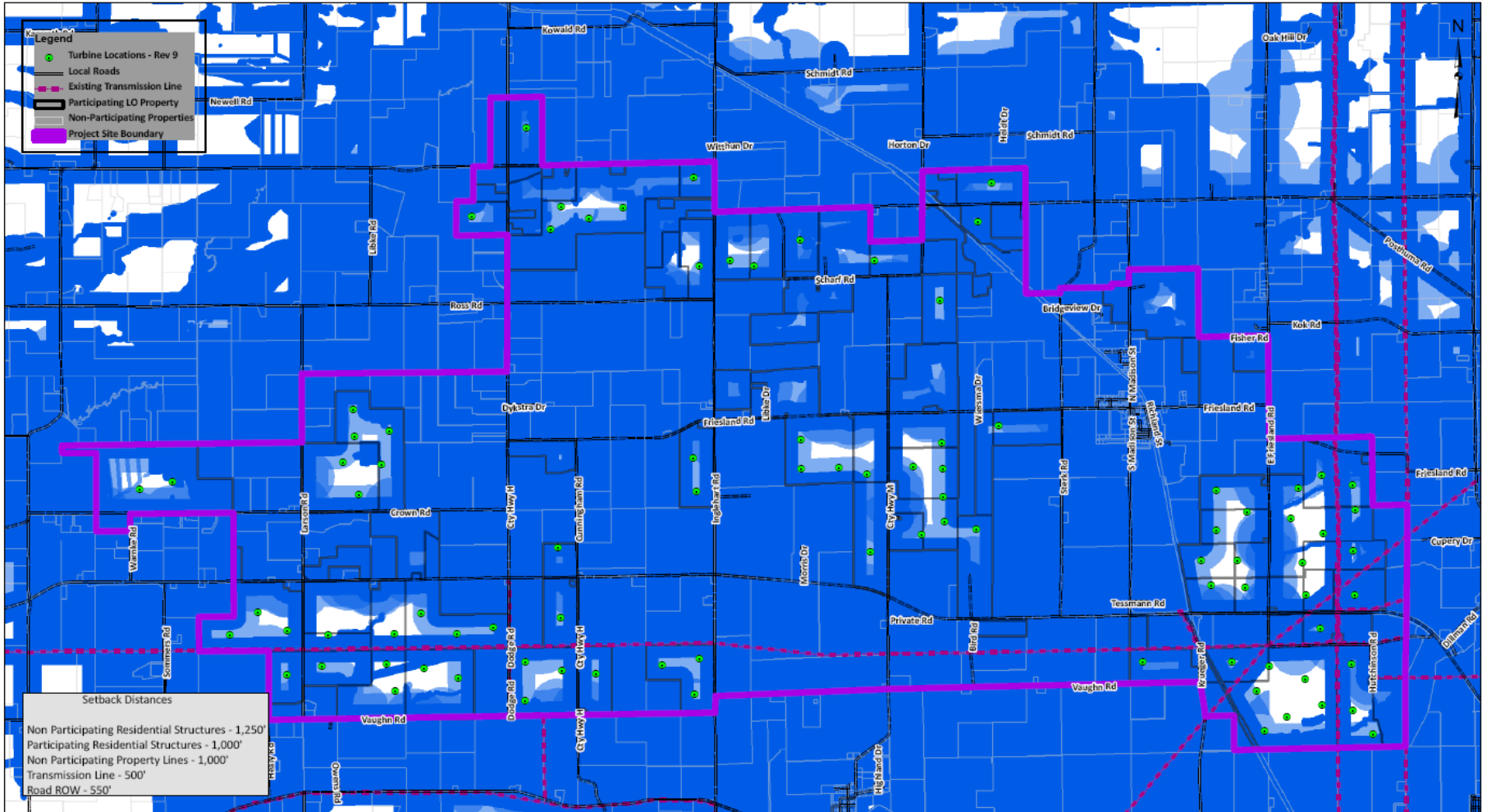
Map 2: Glacier Hills Wind Park

Non-Participating Resident Setback Increased to 1,600'

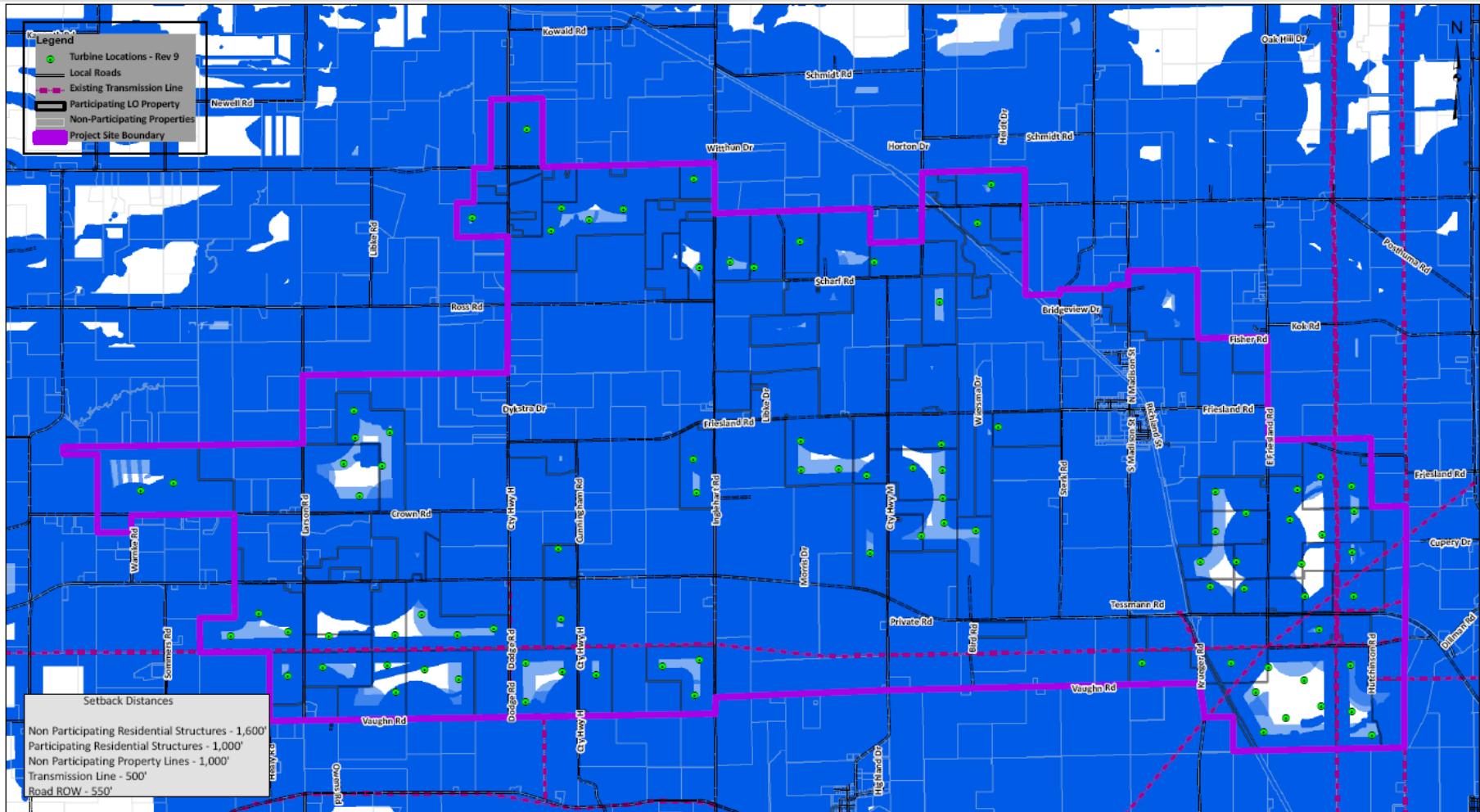
30 Sites Eliminated



Map 3: Glacier Hills Wind Park Property Line Setback Increased to 1,000' 55 Sites Eliminated

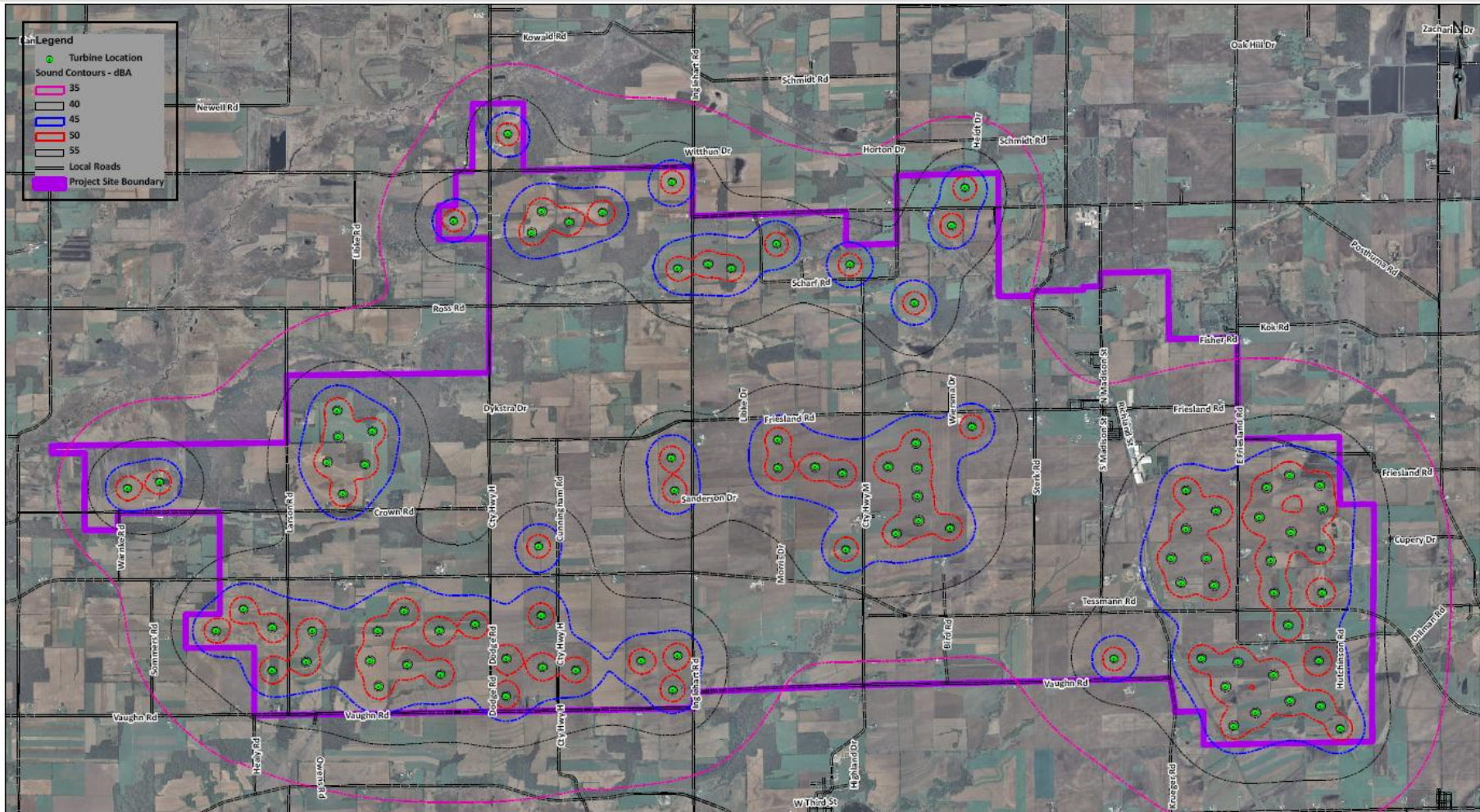


66 Sites Eliminated



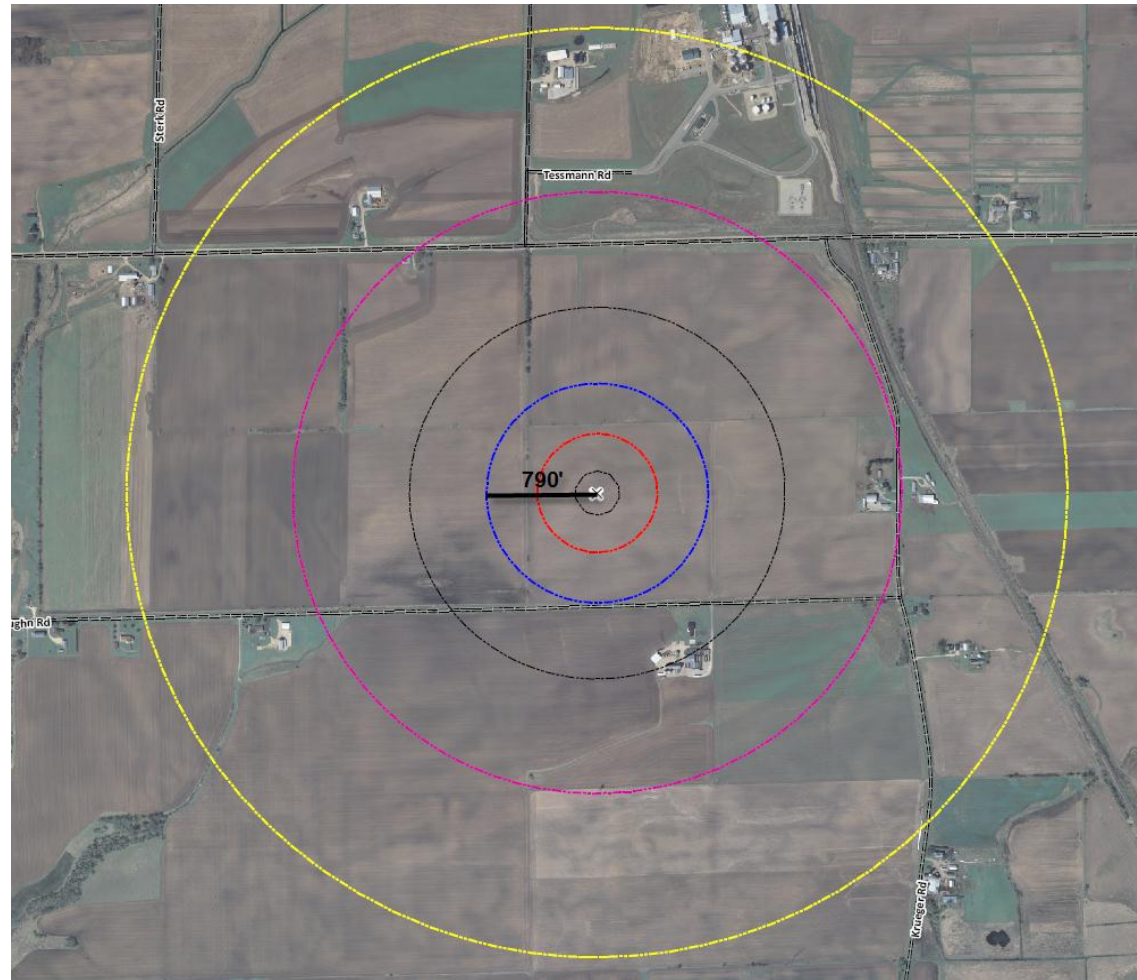
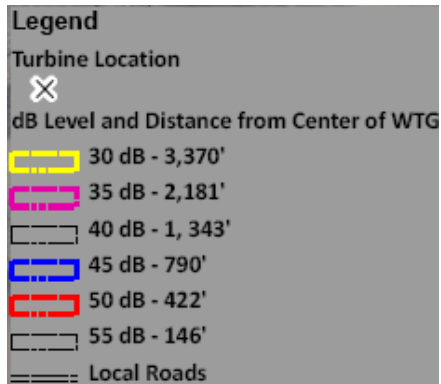
Glacier Hills Wind Park

Sound Contours for 90 V90 Turbines



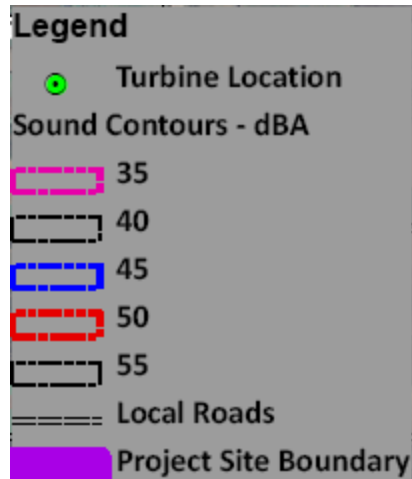
Glacier Hills Wind Park

Sound Contours For Single V90 Turbine

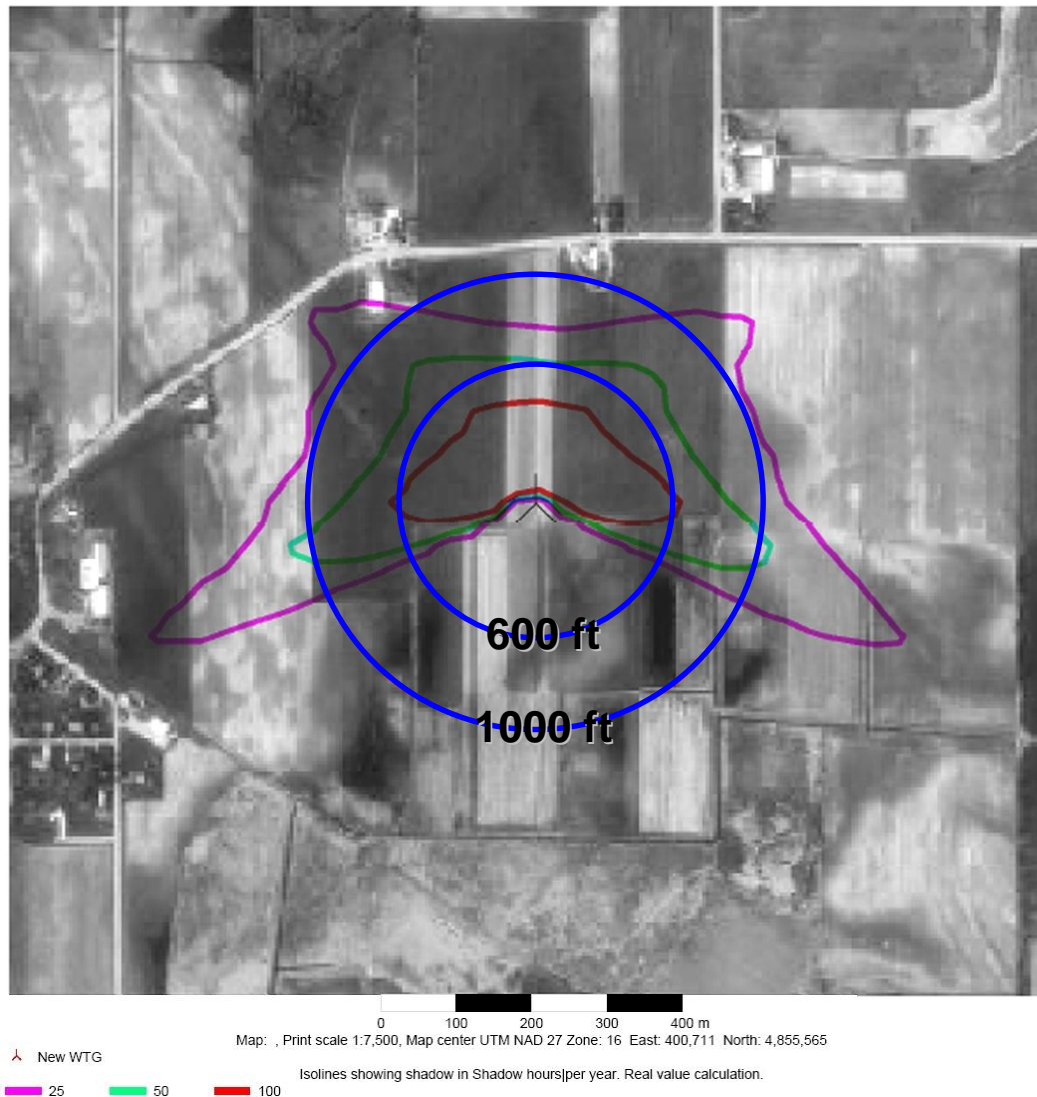


Glacier Hills Wind Park

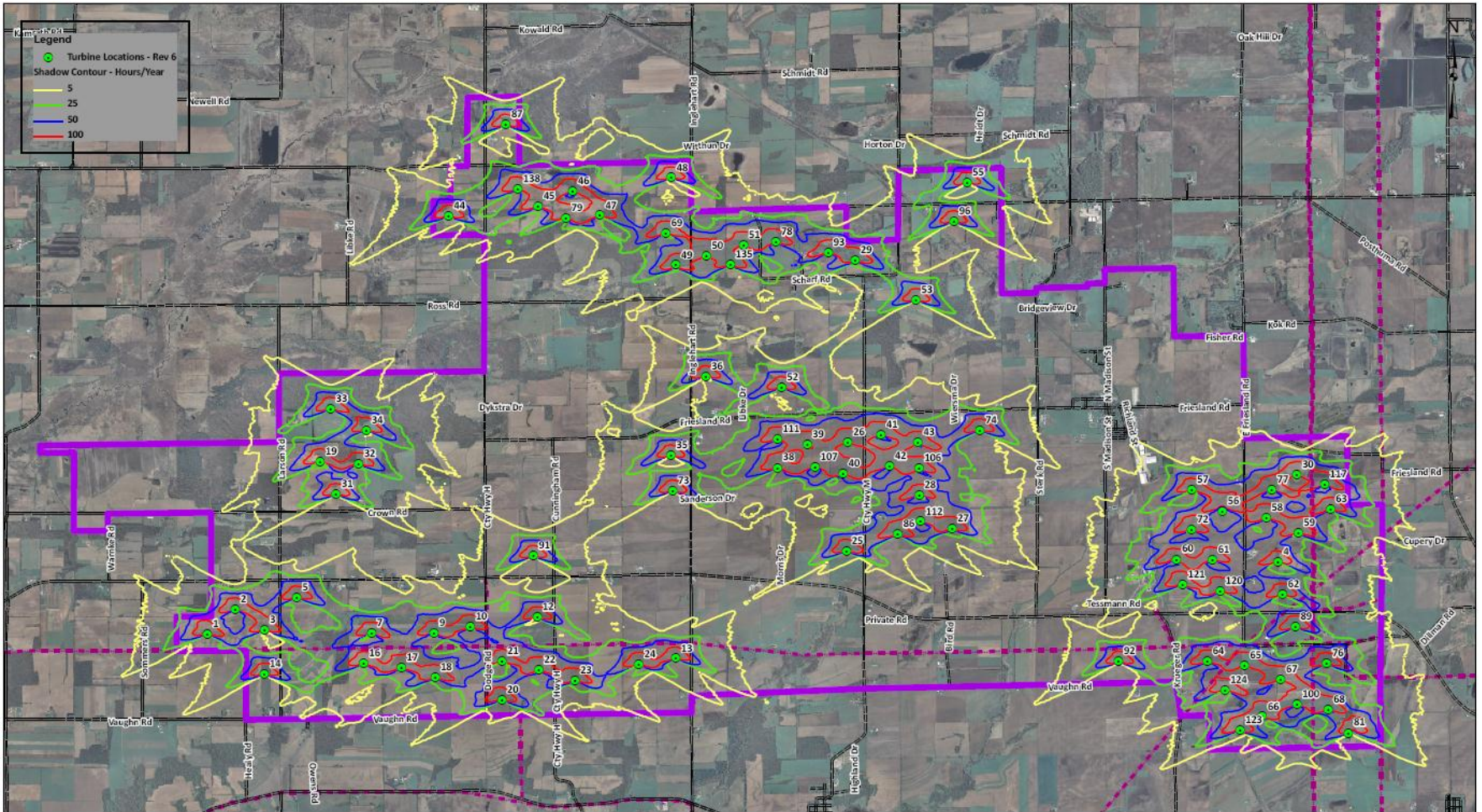
Sound Contours for a Grouping of V90 Turbines



Shadow Contour Around a Turbine



Glacier Hills Wind Park Shadow Contour Projections



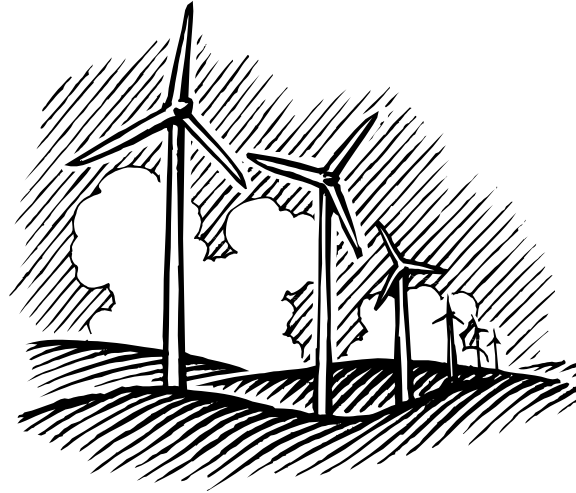
Recommendation on Setbacks & Performance Standards

- Sound levels at a given distance from a turbine(s) can vary substantially
- Shadows are highly dependent on the number of turbines and their relative position
- Setback distances simplistically set at “worst case scenario” levels will unnecessarily eliminate quality sites
- Sound level, hours of shadow, and setback distance thresholds are best used as a package of siting criteria



Meeting the Renewable Standards

In addition to its biomass proposal and solar initiatives, We Energies will need the equivalent of 3 to 5 more large wind projects to comply with 2015 renewable standards



Questions